

FLUORESCENCE AND ULTRAVIOLET ABSORPTION SPECTRA AND RING-TWISTING POTENTIAL ENERGY FUNCTIONS OF 1,2-DIHYDRONAPHTHALENE IN ITS S_0 AND S_1 STATES

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The fluorescence excitation spectra (FES), dispersed fluorescence (SVLF) spectra, and ultraviolet absorption spectra of 1,2-dihydronaphthalene have been collected and analyzed. The $S_1(\pi,\pi^*)$ electronic band origin is at $34,096\text{ cm}^{-1}$. The FES for the jet-cooled molecules shows the four lowest frequency vibrations in the S_1 state to be at 107 , 122 , 197 , and 293 cm^{-1} ; while the SVLF from several excitation bands shows these to be at 131 , 149 , 267 and 347 cm^{-1} in the S_0 state. For both states almost all of the transition frequencies below 800 cm^{-1} can be assigned as combinations of these low-frequency modes. The series of bands beginning with 131 cm^{-1} for S_0 and 122 cm^{-1} for S_1 were analyzed to determine the ring-twisting potential energy functions. For the S_0 state the barrier of about 1300 cm^{-1} is somewhat higher than that (1132 cm^{-1}) for the analogous molecule 1,3-cyclohexadiene. For the S_1 state the barrier increases significantly.